# SAMPLING AND ANALYSIS PLAN

SITE NAME: Carborundum Electro Minerals

SITE LOCATION: Campbell County, Tennessee

U.S. EPA ID # TND057049322

TDSF SITE ID # 07-506

**Prepared by the**
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF REMEDIATION
in cooperation with
WASTE MANAGEMENT DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

DATE: May 22, 2007

**Prepared By: Burl H. Maupin**

Reviewed By: ______________________

Approved By: ______________________

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# SAMPLING AND ANALYSIS PLAN

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LOCATION: Campbell County, Tennessee
36° 18′ 32.9″ North Latitude
84° 11′ 01.1″ West Longitude

U.S. EPA ID # TND057049322

TDOR # 07-506

## 1.0 INTRODUCTION

The Tennessee Division of Remediation has been tasked by the U.S. Environmental Protection Agency (U.S. EPA) Waste Management Division to conduct a Sampling Plan/Site Investigation at the above referenced Site. This investigation will be conducted pursuant to the authority and requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), Public Law 195-510, Section 104, and the Superfund Amendments and Reauthorization Act (SARA) of 1986, Public Law 99-499.

### 1.1 Objectives

The objectives of this sampling investigation are to collect information on the presence of any contaminants at the Site and to assist in developing a site-specific preliminary HRS score to determine if the Site warrants inclusion on the National Priorities List (NPL).

Specific elements of the objectives include the following:

- Characterize the history, location, and nature of past hazardous materials management and disposal activities at the site
- Collect data on the levels and extent of the contaminants present at and near the Site
- Obtain information to prepare a preliminary HRS score, including potential receptors impacted by any contamination migrating from the Site
- Provide EPA the necessary information to make decisions on any other action warranted at the Site

## 1.2 Scope of Work

The scope of this investigation will include, but is not necessarily limited to, the following activities:

- Obtain and review background materials relevant to HRS scoring of Site
- Obtain available maps of the Site
- Obtain information on local water systems
- Evaluate the target population within a 4-mile radius of the Site with regard to surface water use, the possibility of direct contact, ground water use, fire and explosion hazard, and airborne exposure
- Develop a detailed Site sketch
- Collect environmental samples consisting of groundwater, sediment, soil, and surface water samples. Preliminary, limited waste characterization has previously been accomplished. The purpose of these samples is to attempt to further detect the presence of any hazardous substances at the Site, to further identify source area(s) for contaminants, and to further estimate the extent of the contamination.

## 1.3 Schedule

Sample collection will be scheduled once this Study Plan has been submitted to the U.S. EPA. It is anticipated that sampling activities will take place in July 2007. Field sampling activities are expected to require two to three days to complete.

## 1.4 Personnel

The following TDOR personnel are scheduled to perform sampling activities at the Carborundum Electro Minerals Site:

Chris A. Andel - Geologist
W. Lee Barron - Geologist
Burl H. Maupin - Environmental Protection Specialist / Project Manager
Brad Parman – Environmental Specialist
Steve D. Turner - Environmental Specialist

## 1.5 Permits and Authorization Requirements

| Agency/Party | Permit/Authorization |
|---|---|
| TDOR | Property Access - self authorized, if owner cannot be located |

Any additional property access requirements will be identified and addressed as needed.

## 1.6 Site Location and Climatology

Location

The Carborundum Electro Minerals Site (the Site) is located on Stone Mill Road in Caryville, Campbell County, Tennessee (Vicinity Map, Figure 1). The geographic coordinates of this facility are 36° 18′ 32.9″ North Latitude and 84° 11′ 01.1″ West Longitude. The property location, Stone Mill Road, is that listed for a central, privately owned, industrial-zoned parcel, upon which the lone remaining process buildings lie. The Site includes several other parcels for a total of over 100 acres that were owned by the Carborundum Company during its operating tenure. There is residential, commercial, and industrial development on and around the Site. There is limited security at the Site. A public road, Pierce Road, enters the Site. Several residences are located on adjacent properties. The Jacksboro Elementary School is approximately 0.8 mile from the Site. Some surface water drainage from the Site flows 2/10 mile to the Cove Creek embayment of Norris Reservoir.

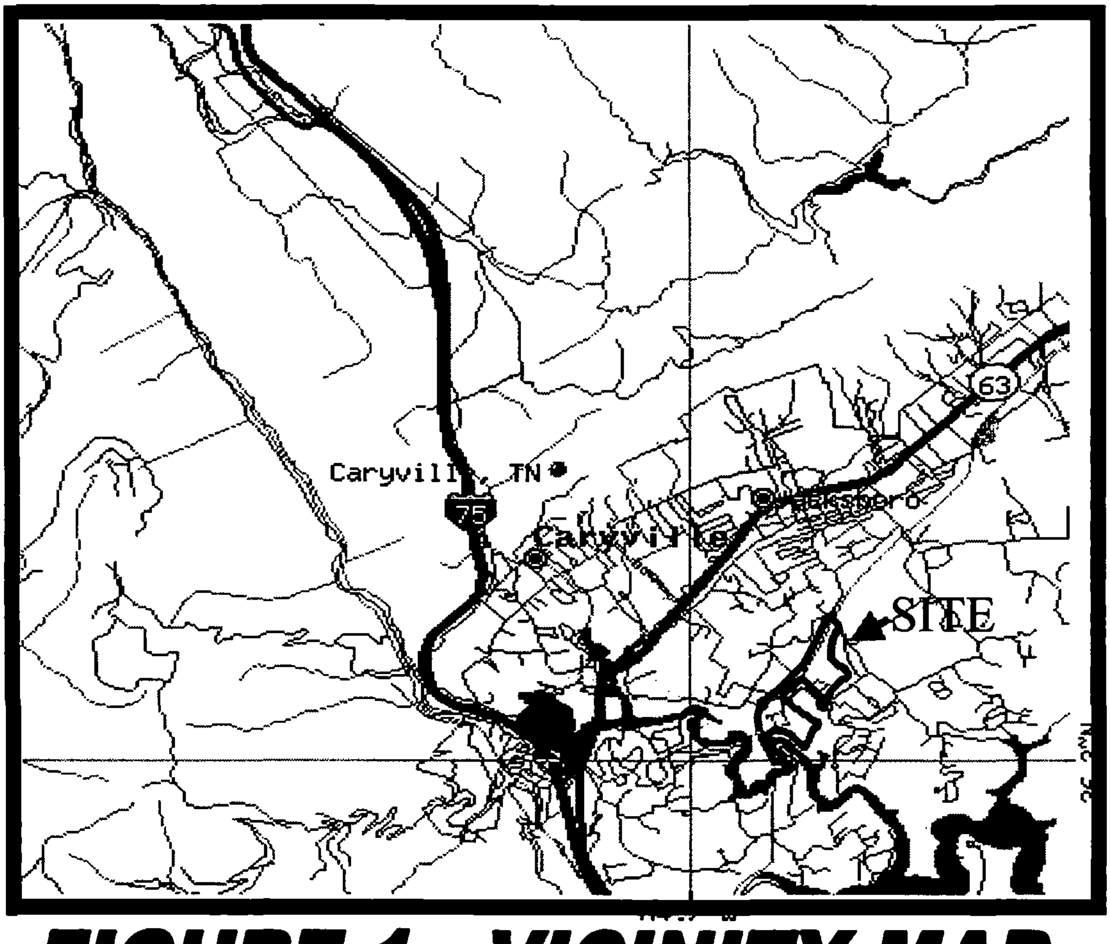



**FIGURE 1 - VICINITY MAP**

## Climatology

East Tennessee does not lie directly within any of the principle storm tracks that cross the country. The area is influenced primarily by storms that pass along the Gulf Coast and thence up the Atlantic Coast, and to a lesser extent by those that pass northeastward from Oklahoma to Maine.

### Temperature

The difference in elevation between mountaintop and valley in East Tennessee causes a considerable variation in temperature. The mean annual temperature of East Tennessee, based upon records from Chattanooga, Caryville, and Bristol is between $57^0$ and $58^0$ F. Temperature extremes of $-32^0$ F in Johnson City and $111^0$ F in Blount County have been recorded. July is the hottest month and January is the coldest. The usual date of the last killing frost ranges from March 30 in Hamilton County to May 10 in Johnson and Carter Counties. The usual date of the first killing frost ranges from October 5 in Johnson and Carter Counties to October 30 in Hamilton County. The growing season varies from 150 to 210 days, depending upon latitude and elevation.

### Precipitation

Precipitation in East Tennessee is controlled in part by topography. It is heavier on the Cumberland Plateau and in the Unaka Mountains than in the Valley and Ridge province. Moist air masses reach the Valley and Ridge province comparatively dry because, in passing over the mountain on either side, their moisture is condensed and precipitated.

Rainfall is well distributed in the study area throughout the year. Caryville's wettest months are January, February, and March (averaging 4.66, 4.51, and 5.05 inches, respectively) and the driest are September, October, and November (averaging 2.68, 2.62, and 3.07 inches, respectively).

Snow occurs only occasionally and lightly in the lowland or valley land, and usually melts within a few hours or days except in shaded areas or near the tops of some of the highest ridges.

### Wind

The topography largely controls the prevailing wind direction. The prevailing winds are from the northeast (15% of the time) and the southwest (12% of the time), but they are relatively light (mean speed is approximately 7.5 mph). Calm conditions exist 11% of the time (USDC/NOAA 1968).

## 1.7 Site Description, Operational History, and Waste Characteristics

### Site Description

The Carborundum Electro Minerals Site includes 105 acres with at least one sinkhole. Carborundum's industrial operations appear to have occurred over approximately 48 acres. This area of concern ranges in elevation from 1080 to 1120. The properties once owned by Carborundum now contain several contiguous active industrial/commercial facilities and residences under various ownerships. The Site, including the process area, contains public roads. The Site contains a landfill, waste piles, an existing process pond, a backfilled settling pond, process material storage areas, a sinkhole, a transformer area, abandoned railways, two original process buildings, and numerous process building sites where releases of hazardous substances may have occurred. There is residential, commercial, and industrial development and farmland surrounding the Site.

Much of the surface water drainage from the Site flows to the on-site sinkhole or the existing on-site pond, which rarely discharges, according to the property owner. A surface discharge from the pond can flow to an underground culvert. The destination of flow from the underground culvert is presently unknown. A small portion of the southern process area appears to flow toward the Cave Spring embayment of Norris Reservoir.

Groundwater from a nearby spring is used as the primary source for a municipal water system that is also supplied with surface water from an intake in the surface water pathway from the Site. Groundwater may be used for private drinking water supplies at some nearby residences.

The nearest school, Jacksboro Elementary School, is approximately 0.9 mile from the Site. A church, formerly a school/daycare, is presently located on-site.

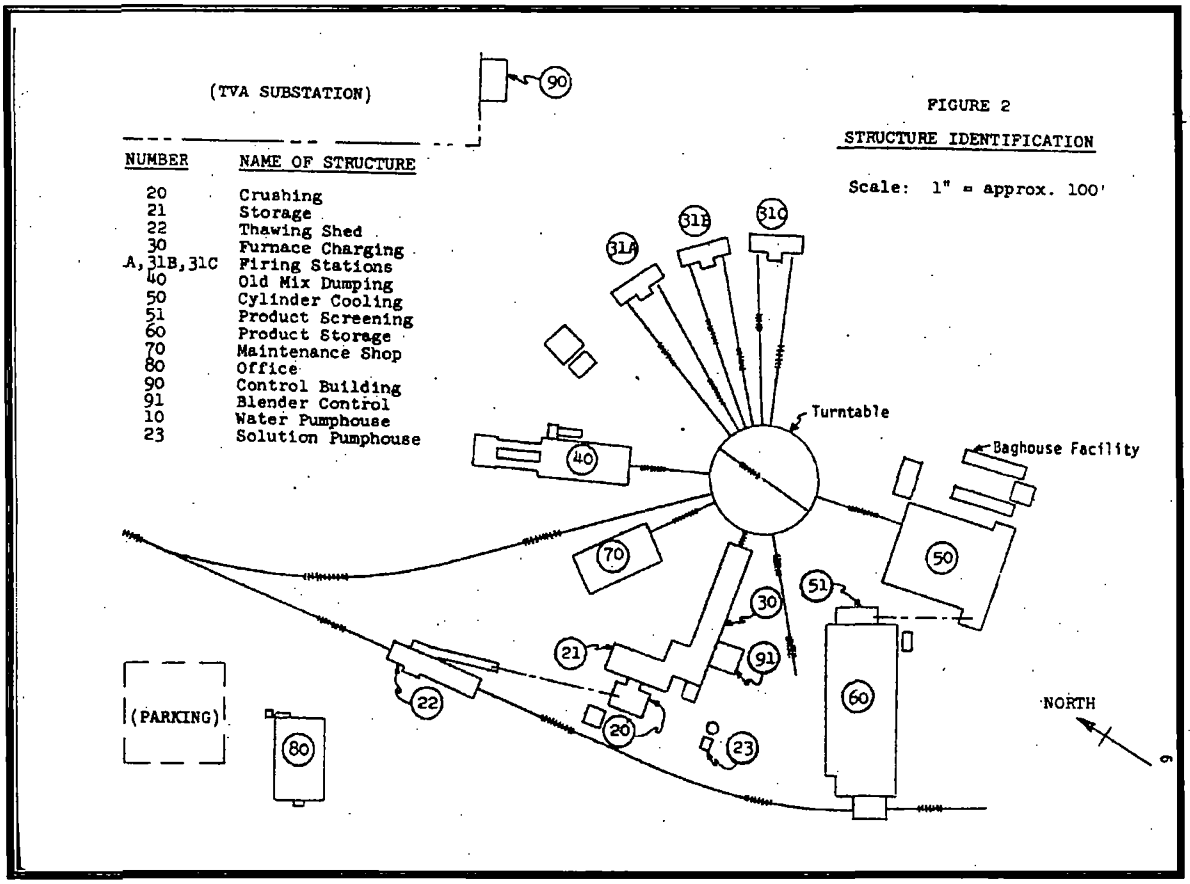
### Operational History

The manufacturing facility which is the subject of this report is an electric furnace facility of The Carborundum Company. The plant was constructed by The Carborundum Company and began operation in 1971. It produced about 25,000 tons per year of "Ferro-Carbo", a granular material high in silicon carbide content, which is ultimately used as a metallurgical additive in the cast iron and steel industries. (Noll. 1981.)

Raw materials used in the manufacture of Ferro-Carbo included petroleum coke and sand. These materials were batched in proper proportions and heated to reaction temperature in an open railroad car furnace. Upon completion of the reaction, the batch was cooled with water and unloaded, with the reacted product then being separated from unreacted raw material ("old mix"). The reacted material was then crushed and blended to form the final end product.

Raw materials generally arrived by rail and were normally bottom dumped into a track hopper in building 22 (see Figure 2, Structure Identification (Noll. 1981.)) and conveyed directly to storage silos in building 21. Raw materials were also stockpiled in the open. Stockpiles of old mix and wet sawdust were also stockpiled in this general area. The sawdust was blended with the raw materials to help maintain porosity during subsequent processing.

Raw material proportioning and loading into the car furnaces occurred in buildings 21 and 30. During the loading process, a core of graphite was placed lengthwise within the charge to provide electrical conductivity and to establish a suitable resistance between terminals situated at either




end of the furnace. The loaded car furnace was then transferred through a railway turntable to one of six firing stations, where the electrical hookup was accomplished. A suitable reaction temperature was then established and maintained until the reaction was complete. Emissions from the heating cycle were not controlled.

After a suitable cooling period, the car furnace was moved to building 40 where the unreacted material was removed. During the reaction process, this material served to insulate sides of the car furnace from intense heat developed at the core. This unreacted material, now known as "old mix", was transferred to the old mix storage pile.

The car furnace with the reacted material was then allowed to cool further. At this point, the reacted material was in the form of a large hollow cylinder. This material was subsequently fed to a crusher and transferred by conveyor for final processing.

## Waste Characteristics

The sources at the Carborundum Electro Minerals Site include any area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that may have become contaminated from hazardous substance migration. In general, however, the volumes of air, ground water, surface water, and surface water sediments that may have become contaminated through migration are not considered sources. In addition to potential off-site sources where atmospheric deposition of air emissions occurred, the following specific, potential source types were present at the Site:

1) Wastes, contaminated soils, and leachate associated with a burial ground

2) Waste piles, contaminated soils, and leachate associated with a backfilled sediment pond

3) Water, sediment, leachate, and berm construction materials associated with an existing surface impoundment

4) Waste piles, contaminated soil, and leachate at an "old mix" storage area for unreacted and partially reacted materials that were removed from furnaces

5) Waste piles, contaminated soil, and leachate at and near process areas where potential releases occurred, including areas associated with the following structures:
   a) firing stations
   b) old mix dumping / slusher building
   c) cylinder cooling
   d) crushing
   e) product screening
   f) product storage
   g) maintenance shop
   h) raw material storage
   i) thawing shed
   j) furnace charging

6) Contaminated soil and leachate associated with an electrical transformer area

7) Waste piles, contaminated soil, and leachate associated with the "boneyard" (scrap pile) area

Analyses of baghouse dust and pond sediment (both buried on-site) by Carborundum in 1981 indicated that the main contaminants of concern were polycyclic aromatic hydrocarbons (PAHs). No analyses were performed for asbestos or TCDD (dioxin), because neither was considered to be "pertinent to wastes disposed at the site and both require very special analysis"

(Carborundum. 1981.). Selected PAH compounds' analytical results are summarized and compared to criteria of concern in the table below.

| Partial PAH Analytical Data<br>**The Carborundum Company, Electro Minerals Division Wastes** | | | | |
|---|---|---|---|---|
| hazardous substance / sample date, description, and *criteria of concern* | Benzo(a)-anthracene | Benzo(b)-fluoranthene* | Benzo(k)-fluoranthene* | Benzo(a)-pyrene |
| 1981 Baghouse Dust | 32,917 | 31,176 | U | 119,710 |
| 1981 Pond Sediment | 13,317 | 10,159 | U | 45,059 |
| *PRG - residential soil* | *620* | *620* | *6200* | *62* |
| *PRG - industrial soil* | *2100* | *2100* | *21,000* | *210* |
| *Soil Screening Levels for Migration to Groundwater* | *80-2000* | *200-5000* | *200-49,000* | *400-8000* |

units: µg/l

* "For the compounds benzo(b)fluoranthene and benzo(k)fluoranthene, the GC retention time and mass spectral data are not sufficiently unique to make a definite distinction between these structurally isomeric compounds. Benzo(b)fluoranthene standards were used to determine the concentrations of these two isomeric compounds in the solid samples." (Advanced Environmental Systems, Inc. 1981. "Analyses For Priority Pollutants. TOC, and COD On Carborundum-Jacksboro Samples". February 18.)

Recent reports have shown that not only silicon carbide dusts but also fibres are liberated into the working environment during the various phases of silicon carbide production (using Acheson furnaces), thus creating a further potential health hazard. An environmental hygiene survey was conducted in a silicon carbide production plant with the aim of quantifying airborne dusts and fibres. Although dust levels were below 50% of the TLV, high concentrations of fibres were observed (analyzed via optical microscopy using the criteria for asbestos fibres), which in some locations reached levels of 2000 fibres/litre with means (GM) between 100 and 780 fibres/litre according to department. These results are assessed in the light of the growing interest of researchers in the experimental effects of silicon carbide fibres. (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=133421 3&dopt=Abstract)

Crystalline silica, which is considered carcinogenic, may also be present.

## 1.8 Site Investigation Activities

The Rules of the Division of Air Pollution Control (DAPC), Chapter 1200-3-19, "Emission Standards and Monitoring Requirements for Additional Control Areas" lists the area bounded by the fence along the property line of the Carborundum Company as a Particulate Additional Control Area. The Knoxville Field Office of the DAPC no longer maintains files on this facility; however, the Nashville Central Office of the DAPC maintains some dated information. DAPC personnel who observed operations at the Site have stated that there were significant air quality concerns. Many complaints about emissions from the facility were received from nearby residents. Additional air pollution control equipment and a larger settling pond were installed shortly before operations ceased.

Formal enforcement action was taken by EPA.
(http://oaspub.epa.gov/enviro/fii_query_dtl.disp_program_facility?p_registry_id=110007859193
)

Some emissions from Carborundum were collected by air pollution control devices and disposed of in an on-site trench. After manufacturing operations ceased, some wastes, including sediment from an on-site settling pond (dry pond), materials from the "boneyard", and baghouse dust, were landfilled on-site.

TDEC's Division of Water Pollution Control attended at least one meeting with Carborundum officials. Carborundum had plans to collect on-site surface runoff and apply it back to the Site using a sprinkler system.

In April 2006, TDEC's Division of Remediation investigated the inactive Carborundum Site. Sand and a black granular or cinder-like material, believed to be present due to Carborundum's operations, were observed over several areas of the Site previously owned by Carborundum. Materials in some places in these areas appeared to sparkle and glitter in daylight. Subsequent waste and groundwater samples indicated the presence of hazardous substances.

The Division of Remediation collected five on-site waste samples from uncontained waste piles in 2006. Metals and PAH were detected at levels of concern. Some of the PAH analytical results are summarized and compared to criteria of concern (preliminary remediation goals (PRGs)) in the table below.

Partial PAH Analytical Data

**The Carborundum Company, Electro Minerals Division Wastes**

| hazardous substance / sample date, description, and *criteria of concern* | Benzo(a)-anthracene | Benzo(b)-fluoranthene | Benzo(k)-fluoranthene | Benzo(a)-pyrene |
|---|---|---|---|---|
| 2006 waste pile at settling pond | 2914 | 5330 | U | 4050 |
| 2006 waste pile at storage area | 717 | 1032 | U | 903 |
| 2006 subsurface waste at storage area | 717 | 1030 | U | 903 |
| 2006 waste pile at firing station | 6850 | 14,700 | 4660 | 9830 |
| 2006 waste pile at baghouse/cylinder cooling/product screening area | U | 490 | U | 384 |
| ***PRG - residential soil*** | ***620*** | ***620*** | ***6200*** | ***62*** |
| ***PRG - industrial soil*** | ***2100*** | ***2100*** | ***21,000*** | ***210*** |
| ***Soil Screening Levels for Migration to Groundwater*** | ***80-2000*** | ***200-5000*** | ***200-49,000*** | ***400-8000*** |

units: µg/l

The Division of Remediation collected water samples from Cave Spring in 2006. Selected PAH compounds' analytical results are summarized and compared to criteria of concern in the table below.

Partial PAH Analytical Data

**Cave Spring, a tributary of Norris Reservoir**

| sample date, description, and *criteria of concern* / hazardous substance | Benzo(a)-anthracene | Benzo(b)-fluoranthene | Benzo(k)-fluoranthene | Benzo(a)-pyrene |
|---|---|---|---|---|
| May 2006 Cave Spring (untreated) | U* | 0.210 | 0.080 | U* |
| June 2006 Cave Spring (untreated) | U* | U* | U* | U* |
| June 2006 Cave Spring (treated municipal water) | U* | U* | U* | U* |
| ***Preliminary Remediation Goal (PRG) - tap water*** | ***0.092*** | ***0.092*** | ***0.92*** | ***0.0092**** |
| ***Consumption Of Water and Organism*** | ***0.0038**** | ***0.0038**** | ***0.0038**** | ***0.0038**** |
| ***Consumption Of Organism Only*** | ***0.018*** | ***0.018*** | ***0.018*** | ***0.018*** |
| ***Primary Drinking Water Maximum Contaminant Level (MCL)*** | ***5*** | - | - | ***0.2*** |

units: µg/l *detection level = 0.01

In 2006, investigation of PAH content in surface soils at six off-site residences by EPA's Emergency Response & Removal Branch resulted in a recommendation of No Further Action.

## 2.0 PATHWAYS

### 2.1 Groundwater Pathway

### 2.11 Hydrogeology

The Carborundum Electro Minerals Site is located in the Southeastern Valley and Ridge physiographic province and the nonglaciated central region hydrogeologic setting. Numerous ridges and intervening valleys characterize the land surface in the Valley and Ridge physiographic region, all trending in the northeast-southwest direction. This orientation is the result of folding and fracturing.

The Cambrian-Ordovician Carbonate aquifer of eastern Tennessee (recently renamed the Valley and Ridge aquifer) consists of extensively folded and faulted carbonate, sandstone, and shale of Cambrian and Ordovician age underlying the Valley and Ridge physiographic province. The rock formations crop out alternately in long, narrow belts, so that aquifer characteristics show marked areal variability. The ridges range in altitude from about 1,500 to over 7,000 feet above sea level; valleys generally range between 750 and 1,000 feet above sea level. Generally regolith is thin over the shales and sandstones and thick over the limestone. The sandstone and shale units are poor aquifers; nearly all the high producing wells and springs are in the dolomitic limestone formations, particularly the upper formations of the Knox Group (Mascot and Kingsport). The Knox aquifer is frequently singled out as a separate aquifer. Water moves through solution-enlarged fractures, which in areas may form extensive networks. The folding and faulting has produced regional anisotropy in aquifer hydraulic properties, and ground water may move preferentially in strike-parallel or strike-normal directions. Well yields commonly range from 5 to 200 gal/min.

The Mascot Formation of the Knox Group underlies the Site. The bedrock consists of essentially flat-lying siliceous (cherty) dolomites and limestones. Weathering of the rock occurs along nearly horizontal bedding planes and enlarged vertical fractures (joints), producing moderately to highly plastic clays containing varying amounts of chert. Soil depths in this area are generally less than twenty feet, although greater depths may be encountered. (MCI. 1981.)

### 2.12 Groundwater Targets

Cave Spring is approximately 0.2 mile distant from the Site. The Cave Spring Well Head Protection Area surrounds the Site. The monitoring requirement for benzo(a)pyrene was waived. The Caryville-Jacksboro Utility District's Cave Spring intake supplied 0.653 million gallons average daily pumpage in 2005. The Norris Lake (Cove Creek) intake provided 0.378. The population served was 9252. The Cave Spring intake served an approximate population of 9252 x 0.653 / (0.653+0.378) = 5860.

No private wells have been found to be in use at nearby residences. The 1995 U. S. Geological Survey National Water-Use Data Files lists 17,150 self-supplied population by ground-water withdrawals for domestic water use (USGS. 1995. U.S. Geolgical Survey, National Water-Use data files. http://water.usgs.gov/watuse/spread95/tnh895.txt) in the 1970 square mile Upper Clinch hydrologic unit, HUC8Code 06010205 (USGS. 2005. U.S. Geological Survey, Water Resources of the United States. http://water.usgs.gov/GIS/huc_ name.txt Last updated June 16.). Proportioned by area and by distance category, the following target self-supplied populations by ground-water withdrawals for domestic water use have been estimated:

| distance category (radius, in miles) | area (square miles) | target population |
|---|---|---|
| 0 to ¼ | 0.196 | 2 |
| ¼ to ½ | 0.589 | 5 |
| ½ to 1 | 2.36 | 21 |
| 1 to 2 | 9.42 | 82 |
| 2 to 3 | 15.7 | 137 |
| 3 to 4 | 22.0 | 192 |
| 0 to 4 | 50.3 | 439 |

The total groundwater pathway target population is 439 + 5860 = 6299.

## 2.13 Groundwater Samples

DOR collected water samples from Cave Spring in 2006. Selected PAH compound analytical results are summarized and compared to criteria of concern in the table below.

| Partial PAH Analytical Data<br>**Cave Spring, a tributary of Norris Reservoir** | | | | |
|---|---|---|---|---|
| hazardous substance / sample date, description, and *criteria of concern* | Benzo(a)-anthracene | Benzo(b)-fluoranthene | Benzo(k)-fluoranthene | Benzo(a)-pyrene |
| May 2006 Cave Spring (untreated) | U* | 0.210 | 0.080 | U* |
| June 2006 Cave Spring (untreated) | U* | U* | U* | U* |
| June 2006 Cave Spring (treated municipal water) | U* | U* | U* | U* |
| ***Preliminary Remediation Goal (PRG) - tap water*** | ***0.092*** | ***0.092*** | ***0.92*** | ***0.0092**** |
| ***Consumption Of Water and Organism*** | ***0.0038**** | ***0.0038**** | ***0.0038**** | ***0.0038**** |
| ***Consumption Of Organism Only*** | ***0.018*** | ***0.018*** | ***0.018*** | ***0.018*** |
| ***Primary Drinking Water Maximum Contaminant Level (MCL)*** | ***5*** | - | - | ***0.2*** |

units: µg/l *detection level = 0.01

A subsequent sample did not detect these compounds. Some criteria of concern are below the detection level for these, and other, contaminants.

Concentrations of several contaminants are present in waste piles and at least one landfill at the Site at levels that may indicate that migration to groundwater could occur. Potential exceedances of migration to groundwater criteria were found in waste analyses for the following:

Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Cadmium
Chloroaniline, 4-
Chromium
Chrysene
Dibenzo(a,h)anthracene
Indeno(1,2,3-c,d)pyrene
Methylphenol, 2-
Nickel
Phenol
Selenium
Vanadium

## 2.14 Groundwater Pathway Conclusions

There is usage of groundwater resources in the area of the Site. A portion of the groundwater discharge from Cave Spring is used for a public water supply. The on-site release of unknown quantities of wastes in an uncontained manner on permeable soil in a Karst region of shallow ground water has occurred. Concentrations of several contaminants are present in waste piles and at least one landfill at the Site at levels that may indicate that migration to groundwater could occur. Groundwater quality is a concern.

## 2. 2 Surface Water Pathway

### 2.21 Site Conditions

The Site is located near the Cave Spring and the Cove Creek embayments of Norris Reservoir. The only surface water flows presently on the Site are due to stormwater runoff. A small portion of the surface water flow from the Site appears to flow to the Cave Spring embayment, which then flows to the Cove Creek embayment. The remaining surface water flow from the Site appears to flow to a sinkhole on the Site.

The Site does not appear to be in the 100-year floodplain, although heavy rainfall may flood the sinkhole and cause an overflow to adjacent property to the northeast.

The surface water pathway is classified for Industrial Water Supply, Fish and Aquatic Life, Recreation, Livestock Watering and Wildlife, and Irrigation by the State of Tennessee along the entire surface water pathway within the 15-mile target distance limit. Portions of this reach are classified for Domestic Water Supply.

### 2.22 Surface Water Targets

The targets along the 15-mile surface water pathway include the users of the Caryville-Jacksboro Utility District's water supply system not served by Cave Spring, users of that portion of the Norris Reservoir fishery and recreation areas, fish and aquatic life, livestock, wildlife, and potential wetland areas.

#### 2.221 Fisheries

The 15.0-mile surface water pathway associated with the Site is classified for Fish and Aquatic Life and is used for fishing.

#### 2.222 Sensitive Environments

The sensitive environments in or adjacent to the 15-mile surface water pathway include several wetlands. The closest wetland appears to be at the probable point of entry to the Cove Creek embayment of Norris reservoir.

Endangered species and critical or sensitive habitat may be present, particularly along the surface water pathway that lies within the Tennessee Valley Authority's Norris Reservation. Further investigation may be necessary.

### 2.223 Public Drinking Water Intakes

The Caryville-Jacksboro Utility District maintains domestic water supply intakes at Cave Spring (0.2 mile from the Site, and a Probable Point of groundwater Entry to surface water (PPE)) and in the Cove Creek embayment of Norris Reservoir at approximately mile 4.3 along the surface water pathway from Cave Spring.

### 2.23 Surface Water Samples

Cave Spring is approximately 0.2 mile distant from the Site. This spring may be potentiometrically downgradient of the groundwater surface expected to be at the Carborundum Electro Minerals Site. One aqueous sample collected from this spring contained benzo(b)fluoranthene and benzo(k)fluoranthene, which are present in sources at the Carborundum Electro Minerals Site. A subsequent aqueous sample found no detectable levels of these hazardous substances, at detection levels greater than some levels of criteria of concern. This data is summarized in the table in §2.13 Groundwater Samples.

### 2.24 Surface Water Pathway Conclusions

Unknown quantities of hazardous substances are present in uncontained sources at the Site, where releases to surface water may have occurred. The direct observation of releases to groundwater indicates a potential for groundwater to surface water migration of contaminants. The potential exists for impacts to public drinking water intakes, fisheries and recreation areas, public areas, residences, aquatic life, wetlands, livestock, wildlife, private drinking water intakes, and receptors of irrigated food crops. Hazardous substances are located in an area where precipitation is sometimes heavy and releases have occurred. Some of the detected hazardous substances in sources at the Site are bioaccumulative, toxic, and persistent in the environment. The quality of the surface water associated with the Site is a concern.

## 2.3 Soil Exposure Pathway

### 2.31 Site Soil Conditions

The Carborundum Electro Minerals Site lies in a commercial, industrial, and residential area along Stone Mill Road in Caryville. The Site is minimally restricted so that the Site is moderately accessible.

Large quantities of hazardous substances were managed and disposed of at the Site. The potential for spills onto the ground and for contaminated surface water to migrate could cause soils to become contaminated. Particulate emissions of hazardous substances to the ground occurred while the facility was active.

## 2.32 Soil Exposure Targets

An estimated 12,900 people live within four miles of the Site, and 1310 within one mile, based on the 2000 census data. There is no resident population, but approximately 30 people work on the Site. Access to the Site is not restricted, thus, soil exposure could occur. Potential targets along the on-site soil exposure pathway appear to be workers, adults, and children from area neighborhoods. The nearest presently operating daycare facility and school are over 200 feet away from suspected areas of contamination at the Site. A church, formerly a school/daycare, is located on-site. There may be residences within 200 feet of the facility. Residential complaints of particulate and gaseous emissions to off-site properties have been made while the facility was active. In 2006, investigation of PAH concentrations in some off-site residential surface soils by EPA's Emergency Response & Removal Branch resulted in a recommendation for No Further Action.

## 2.33 Soil Samples

The Division of Remediation collected five on-site waste samples from uncontained waste piles in 2006. Four of these uncontained waste samples were collected from the surface at ground level, thus, are assessed through the soil exposure pathway. These samples were identified to be waste, based on professional judgement, but may have contained soil. Metals and PAH were detected at levels of concern. Some of the PAH analytical results are summarized and compared to criteria of concern in §1.8 Site Investigation Activities.

In 2006, investigation of PAH content in some off-site residential surface soils by EPA's Emergency Response & Removal Branch resulted in a recommendation for No Further Action.

## 2.34 Soil Exposure Pathway Conclusions

The presence of hazardous substances contaminating the soil at this Site is certain, but definition of the threats posed by the soil exposure pathway is not complete. All on-site surface samples evaluated for industrial soil exposure preliminary remediation goals failed due to benzo(a)pyrene concentrations.

There is no resident population, so several exceedances of residential soil PRGs are not applicable. Several workers are present on the Site. The nearest residences may be within 200 feet of the Site. Heavy particulate migration via the air pathway occurred from the active facility, which increases the possibility of exposure via the soil pathway. There is unrestricted access to portions of the Site. Hazardous substances exist and cause exposure when entry to the Site occurs. The soil exposure pathway is of concern.

## 2.4 Air Pathway

### 2.41 Site Conditions

The Carborundum Electro Minerals Site lies in a commercial, industrial, and residential area on Stone Mill Road within the Caryville city limits. Entry onto the Site occurs daily. Particulate and gaseous migration occurred while the facility was active, and could still occur due to disturbances of uncontained wastes and contaminated soil. Extremely hazardous crystalline silica and silicon carbide fibers (whiskers) may be in uncontained wastes and surface soils at the Site.

### 2.42 Air Pathway Targets

An estimated 12,900 people live within four miles of the Site, based on the 2000 census data. An estimated three persons (primary targets) reside within ¼ mile, and 30 persons work on the Site. There is no resident population. Access to the Site is not fully restricted. Potential targets along the on-site air pathway appear to be workers at the Site or adults and children from area neighborhoods. The nearest presently operating daycare facility and school are over 200 feet away from suspected areas of contamination at the Site.

### 2.43 Air Monitoring

No known air monitoring has been conducted at the inactive facility.

The Rules of the Division of Air Pollution Control (DAPC), Chapter 1200-3-19, "Emission Standards and Monitoring Requirements for Additional Control Areas" lists the area bounded by the fence along the property line of the Carborundum Company as a Particulate Additional Control Area. The Knoxville Field Office of the DAPC no longer maintains files on this facility; however, the Nashville Central Office of the DAPC maintains some dated information. DAPC personnel who observed operations at the Site have stated that there were significant air quality concerns.

Formal enforcement action was taken by EPA.
(http://oaspub.epa.gov/enviro/fii_query_dtl.disp_program_facility?p_registry_id=110007859193
)

### 2.44 Air Pathway Conclusions

The Carborundum Electro Minerals Site could pose a threat to human health and/or the environment via the air pathway. The potential for particulate migration makes further investigation of exposure via the air pathway of importance if the baghouse dust dump becomes disturbed and if crystalline silica and silicon carbide fibers (whiskers) are found to be in uncontained wastes and surface soils that may become disturbed (e.g., construction activities).

## 3.0 SAMPLING INVESTIGATION

A total of twenty-two samples, including one quality control sample, are scheduled to be collected during this Site Investigation. This sampling schedule is subject to modification by conditions encountered in the field, but is tentatively planned as outlined in the following subsections. The Proposed Sample Locations are as shown in Figures 3A and 3B. The sample collection codes, types, locations, and sample justification, for each sample proposed for the Carborundum Electro Minerals Site Investigation, are outlined in Table 2.

### 3.1 Sample Coding

Samples will be coded according to EPA guidelines, as shown in Table 1, below.

| TABLE 1 - STANDARD SAMPLE CODES | | | |
|---|---|---|---|
| Water Samples | Soil Samples | Additional Codes | |
| PB - Public (Municipal) Well | SS - Surface Soil | AR - Air | QC - Quality Control |
| MW - Monitoring (Permanent) Well | SB - Subsurface Soil | SL - Sludge | TB - Trip Blank |
| TW - Temporary (Well Point) Well | SZ - Saturation Zone | WA - Waste | FB - Field Blank |
| IW - Industrial Well | CS - Composite Soil | DR - Drum | ER - Equipment Rinsate |
| SW - Surface Water | LS - Leachate Soil | AQ-Aquatic | |
| SP - Spring Water | SD - Sediment | (Biological) | |
| LW - Leachate Water | | | |

All sample codes will consist of 7 characters in the following format: Site Name - Sample Type - Sample Number.

### 3.2 Analysis Requested/Contract Laboratory

All samples will be analyzed for the semi-volatiles and inorganics of the Target Compound List (TCL) and the Target Analyte List (TAL). Only two samples (one water and one sediment) will be analyzed for PCBs. No samples will be analyzed for volatile organics, pesticides, or cyanide. A contract lab will perform analyses in accordance with U.S. EPA contract laboratory procedures.

No further collection of information on the potential presence of crystalline silica and silicon carbide fiber (whiskers) contaminants at the Site are planned at this time.

### 3.3 Analytical and Container Requirements

Sample containers used will be in accordance with the requirements specified in the EPA Office of Superfund Remediation and Technology Innovation's Contract Laboratory Program (CLP) Guidance for Field Samplers, OSWER 9240.0-35, EPA540-R-00-003, Final August 2004.
Container Type Specifications, Quality Control Sample Types, CLP Submission Requirements, and Organic and Inorganic Collection Parameters (see Tables 2.2, 3.1, 3.2, and 3.3 in Appendix) are as shown in Tables 3-6.

## 3.4 General Methodology

All sample collection, sample preservation, and chain-of-custody procedures used during this investigation will be in accordance with the standard operating procedures as specified in Section 3 and 4 of the Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual; U.S. EPA, Region IV, Environmental Services Division, February 1991.

All laboratory analyses and laboratory quality assurance procedures used during this investigation will be in accordance with standard procedures and protocols as specified in the Analytical Support Branch Operations and Quality Assurance Manual; U.S. EPA, Region IV, Environmental Services Division; revised June 1, 1985, or as specified by the existing U.S. EPA standard procedures and protocols for the contract analytical laboratory program.

## 3.5 Waste Sampling

Preliminary, limited waste characterization has previously been accomplished. No waste samples are planned to be collected from any of the several waste piles present at the Site. Leachate water and sediment samples, that could be considered to be sources, if contaminated, will be collected from the on-site pond that may receive leachate from several waste piles and contaminated soil areas. Other sediment samples that are collected from wet weather conveyances may prove to be contaminated soil areas, that could be considered to be sources.

## 3.6 Surface and Subsurface Soil Sampling

Potentially contaminated soils are expected to most likely occur at the surface near waste piles and in on-site wet weather conveyances. The potential for soil contamination due to particulate migration via the air pathway exists, but preliminary results of an investigation of semi-volatile organics in nearby residential soils in October 2006 indicated that this potential might be low.

Two surface soil samples, including one control, are planned to be collected during the Site Inspection. Soil from the on-site Church grounds will be sampled. See Table 2 and Figures 3A and 3B for the proposed locations of these samples. No subsurface soil samples are planned.

Sediment collected from an on-site sinkhole and an on-site wet weather conveyance may be evaluated as soil. Additional analyses for PCBs will be performed.

## 3.7 Surface Water and Sediment Sampling

Four aqueous and six sediment surface water samples (not including the associated quality control samples) are proposed to be collected from the surface water pathway. See Figures 3A and 3B for the proposed locations of these samples.

One set of aqueous and sediment samples will be collected downstream of Cave Spring, near the expected probable point of entry of both overland flow and groundwater to surface water, midway along the Cave Spring tributary's reach, if sediment can be obtained. One control set of aqueous and sediment samples will be collected in Cove Creek upstream of the surface water pathway and any other expected groundwater to surface water probable point of entry to Cove Creek and its surface tributaries. One set of aqueous and sediment samples will be collected in Cove Creek downstream of the Cave Spring tributary, but upstream of the Norris Lake intake. One set of aqueous and sediment samples will be collected in the on-site pond.

The remaining sediment samples will be collected from the on-site south wet weather conveyance and the on-site sinkhole. The watershed that discharges surface flow to the on-site sinkhole presently includes the landfill area, and may have previously included the boneyard and overflows from the old settling pond before the new pond was constructed. Sediment sample locations are as shown in Figures 3A and 3B. Day 2 (see Table 2) sediment samples will also be analyzed for PCBs.

## 3.8 Groundwater Sampling

Five groundwater-related samples are proposed, including Cave Spring which is used as a public water supply source. Groundwater sample locations are shown in Figure 3A, "Proposed Sample Locations".

## 3.9 Background Sampling/Quality Control Sampling

The proposed sample schedule outlined in the preceding subsections includes the background/control samples required for this investigation. One background/control sample will be collected from each of the following media: groundwater, aqueous surface water, surface water sediment, and surface soil. Matrix spike/matrix spike duplicate samples will be collected at the background soil and groundwater locations.

Four quality control samples are scheduled to be collected for this investigation. One duplicate groundwater sample will be collected from Cave Spring. One duplicate sediment sample will be collected from an on-site sinkhole. Two water field blanks will be submitted for analysis.

# 4.0 FIELD HEALTH AND SAFETY PLAN

## 4.1 Purpose

The purpose of this safety plan is to assign responsibilities, establish personnel protection standards, establish mandatory safety operating procedures, and provide for contingencies that may arise while conducting this Site Screening Investigation. All aspects of the field operations must comply with the U.S. EPA "Standard Operating Safety Guides" section of Personnel Protection and Safety course manual and Occupational Safety and Health Administration regulations (29 CFR 1910.120).

## 4.2 Site Safety Officer

The Site Safety Officer (SSO) for this Site Investigation is: Chris Andel, TDOR-Knoxville Field Office.

Designated alternate SSO: Lee Barron

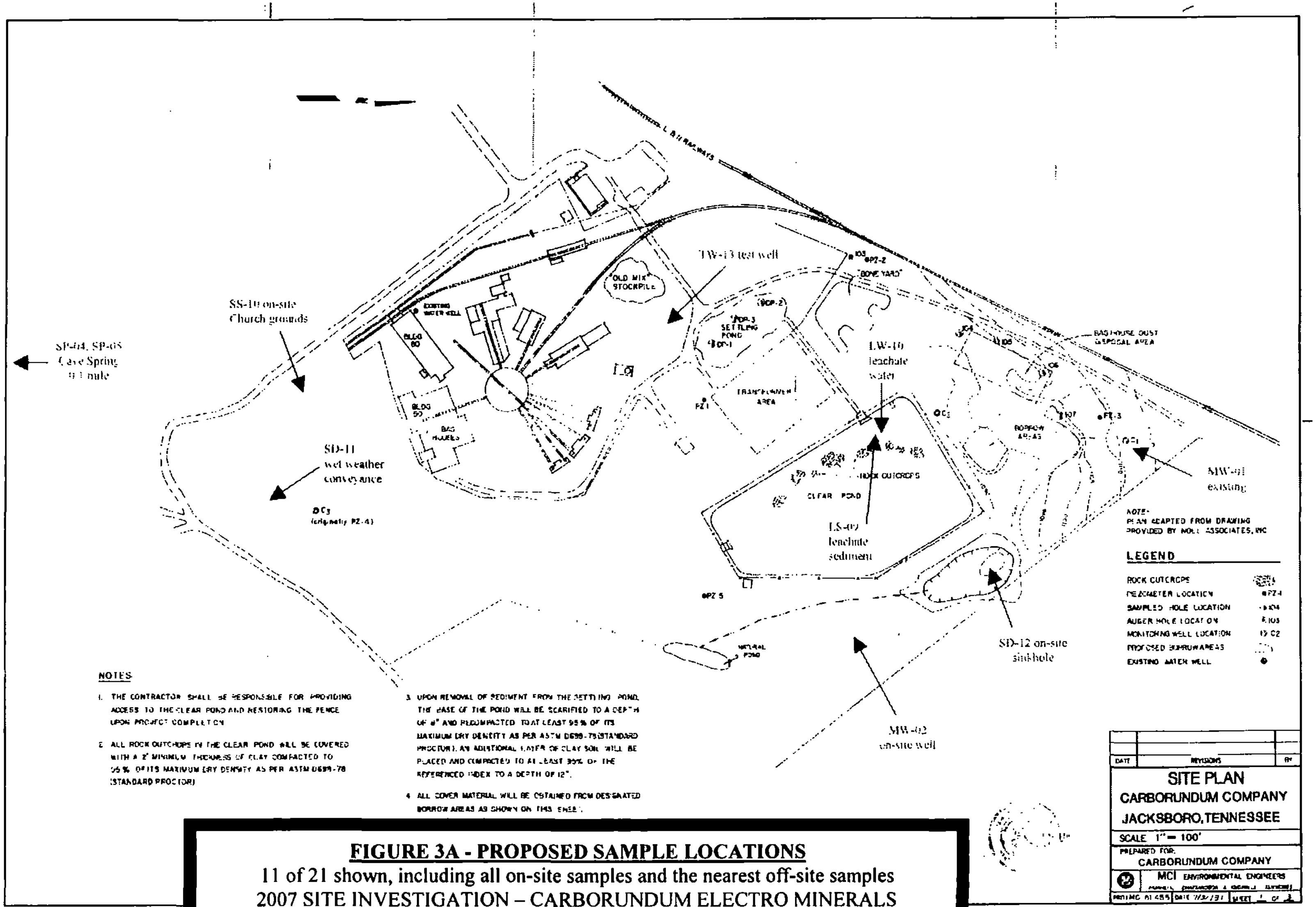



**FIGURE 3A - PROPOSED SAMPLE LOCATIONS**

11 of 21 shown, including all on-site samples and the nearest off-site samples

2007 SITE INVESTIGATION – CARBORUNDUM ELECTRO MINERALS

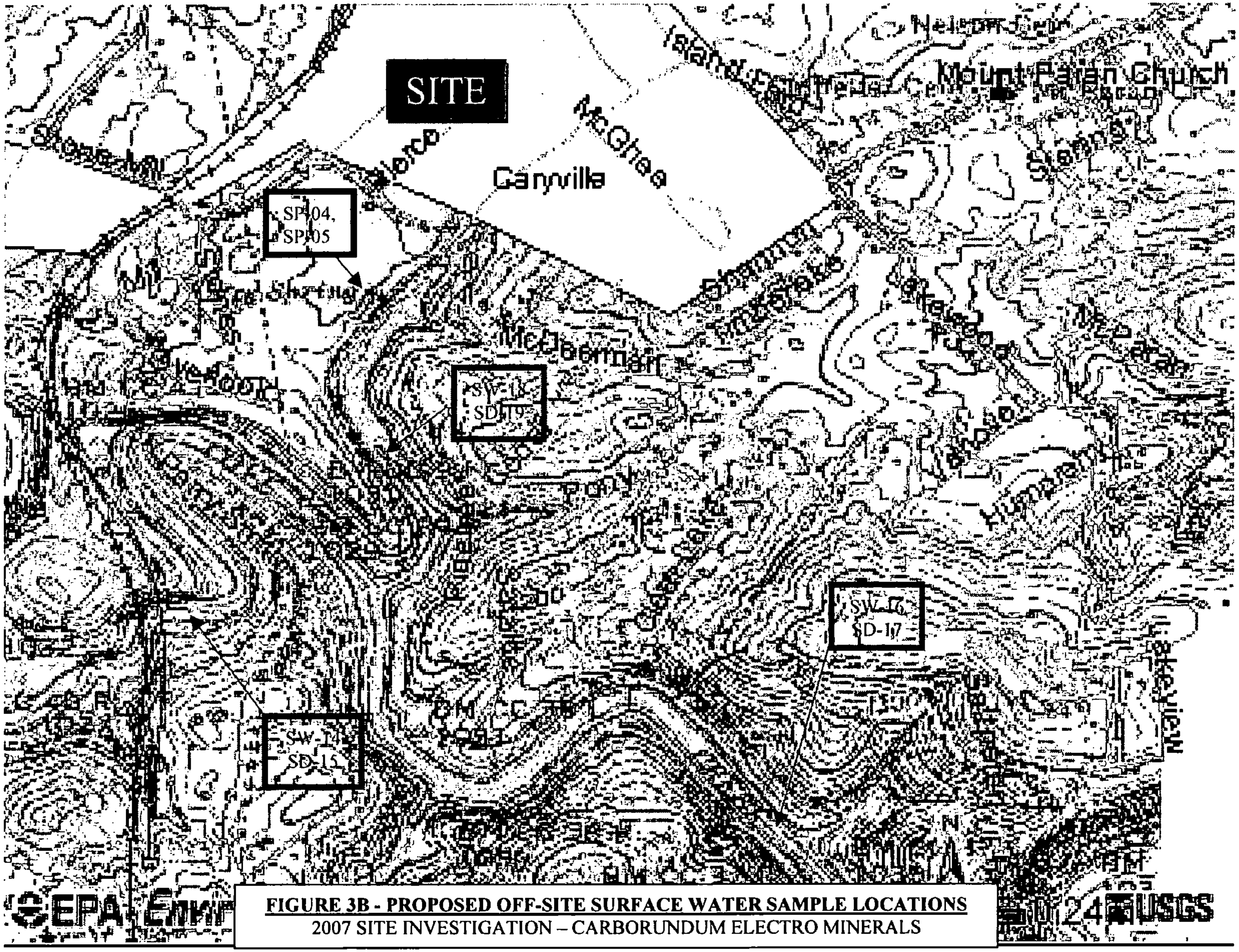



**FIGURE 3B - PROPOSED OFF-SITE SURFACE WATER SAMPLE LOCATIONS**
2007 SITE INVESTIGATION – CARBORUNDUM ELECTRO MINERALS

The Site Safety Officer will assure that appropriate personnel protection equipment is available and properly utilized by all members of the field investigation team. He will also assure that proper emergency first aid equipment is available (eye wash station, first aid kit, etc.). The SSO's responsibilities will include oversight of work practices that will insure personnel safety and correction of work practices or conditions that are or may appear to be hazardous. The SSO will have ultimate authority on all safety decisions and can suspend investigation operations if required safety procedures are not followed or if conditions become too hazardous for the level of protection provided.

## 4.3 Protective Clothing

On-site personnel will wear modified level D personal protective equipment during sampling activities. Modified level D consists of normal work clothes worn beneath tyvek coveralls and disposable nitrile gloves, and includes safety glasses, steel-toed boots, disposable outer boots, and dust mask or particulate cartridge respirators. Variations to this planned level of protection will be made by the Site safety officer if Site conditions warrant up-grading to a higher level.

Level C protection will include the addition of air-purifying, full-face respirators equipped with NIOSH approved cartridges for respiratory protection and special prescription eyeglass kits (if needed). Additional protective equipment including hearing protection and hard hats will be utilized as Site conditions warrant.

## 4.4 Safety Equipment

Prior to and during sampling activities the work environment will be monitored to evaluate the associated risks. This evaluation will include monitoring the sampling areas with a Ludlum sodium iodide or BICRON radiation meter and monitoring the breathing zone with an H-Nu photo ionization detector and/or an Organic Vapor Analyzer flame ionization detector, and an MSA LEL/$O_2$ Meter. If conditions more hazardous than those presently anticipated are encountered (such as an LEL > 10%, or a PID/FID reading > 200 ppm), project operations shall cease until additional protection can be acquired or conditions return to a less hazardous state.

## 4.5 Site Specific Safety Instructions

Prior to the start of project operations, the Site safety officer will discuss health and safety concerns with project personnel. This will include such physical hazards as the safe operation of soil boring and sampling equipment; the risk of slips, trips and falls; and hypothermia associated with outdoor activities during the winter season. The chemical hazards associated with sampling soil and water contaminated by organic compounds and metals will also be covered.

The health and safety briefing will outline the procedures to be followed during an emergency situation, and the route to the nearest hospital. The nearest hospital is the St. Mary's Medical Center of Campbell County in LaFollette (8 miles from the Site).

## Emergency Phone Numbers

Ambulance Service, Caryville Fire Department................................................ 911
St. Mary's Medical Center of Campbell County,
923 East Central Avenue, LaFollette....................................423-907-1200
Campbell County EMA,
136 N. Massachusetts Ave., LaFollette...................................423-566-6151
National Response Center..................................................................800-424-8802
EPA Region IV Emergency Response and Removal Branch,
Removal/Cleanup Public Information Line...........800-564-7577
EPA Region IV 24 Hour Spill Reporting Number.............................404-562-8700

## REFERENCES


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TABLE 2 - LIST OF PROPOSED SAMPLES' CODES, TYPES, LOCATIONS, JUSTIFICATIONS, and COLLECTION SEQUENCE
2007 Site Investigation
SITE NAME: Carborundum Electro Minerals LOCATION: Campbell County, Tennessee
(analyses for semivolatile organics and inorganics, all samples; add PCB analyses to Day 2 samples only)

| DAY | TEAM | SAMPLE ID | TYPE | LOCATION | JUSTIFICATION | NOTE |
|---|---|---|---|---|---|---|
| 1 | 1 | MW-01 | groundwater | on-site well C1 | Control | |
| | 1 | MW-02 | groundwater | on-site well | Release | |
| | 1 | LW-03 | leachate water | on-site pond | Release | |
| | 2 | SP-04 | groundwater | Cave Spring | Release | +MS/MSD |
| | 2 | SP-05 | groundwater | duplicate | Quality Control | |
| | 2 | TW-06 | groundwater | on-site test well | Release | |
| | 2 | SP-07 | field blank | - | Quality Control | |
| | | | | | | |
| 2 | 1 | SS-08 | surface soil | residential | Control | |
| | 1 | LS-09 | leachate sediment | on-site pond | Release | |
| | 1 | SS-10 | surface soil | on-site Church grounds | Release | |
| | 2 | SD-11 | sediment | southern on-site wet weather conveyance | Release | |
| | 2 | SD-12 | sediment | on-site sinkhole | Release | +MS/MSD |
| | 2 | SD-13 | sediment | duplicate | Quality Control | |
| | | | | | | |
| 3 | 1+2 | SW-14 | water | Cove Creek – upstream | Control | |
| | 1+2 | SD-15 | sediment | Cove Creek – upstream | Control | |
| | 1+2 | SW-16 | water | Cove Creek - downstream | Release | |
| | 1+2 | SD-17 | sediment | Cove Creek - downstream | Release | |
| | 1+2 | SW-18 | water | Cave Spring embayment | Release | |
| | 1+2 | SD-19 | sediment | Cave Spring embayment | Release | |
| | 1+2 | SW-20 | field blank | - | Quality Control | |

| TABLE 3 - Low Medium and Low Concentration Organic Collection Parameters (SOM01.1) | | | | | | |
|---|---|---|---|---|---|---|
| Analysis | Matrix | Containers | Volume/ Mass | Important Notes | Preservative | Technical Holding Time[1] |
| Volatile Organics | Water | At least two 40 mL glass containers with Polytetrafluoroethylene (PTFE)-lined septa and open top screw-caps (see Table 5, Reference Number 1). If Selected Ion Monitoring (SIM) analysis is requested, at least two additional 40 mL glass containers with PTFE-lined septa and open top screw-caps that are filled to capacity with no air bubbles, preserved to a pH of 2 with HCl, and cooled to 4°C (±2°C) immediately after collection (see Table 5, Reference Number 1). | Fill to capacity | Vials must be filled to capacity with no headspace or air bubbles. Refer to Appendix C for samples requiring QC analyses. | Preserve to a pH of 2 with HCl and cool to 4°C (±2°C) immediately after collection.[2] DO NOT FREEZE water samples. | 14 days |
| | Soil/ Sediment | At least three coring tools used as transport devices (e.g., 5 g Samplers) (see Table 5, Reference Number 7). AND One container of sample filled with no headspace for determination of moisture content. | 5 g | Refer to Appendix B for samples requiring QC analysis. | Frozen (-7°C and -15°C) or iced to 4°C (±2°C). | 48 hours |
| Semivolatile Analytes | Water | At least two 1 L amber glass bottles, fitted with screw-caps lined with PTFE (see Table 5, Reference Number 5). | 2 L | If amber containers are not available, the samples should be protected from light. | Cool all samples to 4°C (±2°C) immediately after collection. DO NOT FREEZE water samples. | 7 days |
| | Soil/ Sediment | Use one 8 oz wide-mouth glass jar or two 4 oz wide-mouth glass jars (see Table 5, Reference Numbers 3 and 4). | Fill to capacity | | Cool all samples to 4°C (±2°C) immediately after collection. | 14 days |
| Pesticides/ Aroclors | Water | At least two 1 L amber glass bottles, fitted with screw-caps lined with PTFE (see Table 5, Reference Number 5). | 2 L | If amber containers are not available, the samples should be protected from the light. | Cool all samples to 4°C (±2°C) immediately after collection. DO NOT FREEZE water samples. | 7 days |
| | Soil/ Sediment | Use one 8 oz wide-mouth glass jar or two 4 oz wide-mouth glass jars (see Table 5, Reference Numbers 3 and 4). | Fill to capacity | | Cool all samples to 4°C (±2°C) immediately after collection. | 14 days |

[1] **This technical holding time is calculated from the time of sample collection to sample extraction. Sample extracts are to be analyzed** within 40 days of extraction. It is recommended that samplers ship samples to the laboratory on the same day that they are collected, or as soon as possible thereafter.

[2] Check Regional guidance regarding use of acid preservatives when testing for carbonates, residual chlorine, and other oxidants

[3] When sampling for VOAs in soil using the CLP options of SW-846 Method 5035A, samplers should use the requirements that are provided in Appendix B

SOURCE: EPA Office of Superfund Remediation and Technology Innovation's Contract Laboratory Program Guidance for Field Samplers OSWER 9240.0-35, EPA540-R-00-003, Final August 2004

## TABLE 4. Inorganic Sample Collection Parameters (SOW ILM05.3)

| Target Analyte/Method | Matrix | Containers | Volume/ Mass | Important Notes | Preservative | Technical Holding Time[1] |
|---|---|---|---|---|---|---|
| Metals/Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) and/or Mercury by Cold Vapor Atomic Absorption (CVAA) | Water | Use one 1 L high density polyethylene glass bottle (see Table 5, Reference Number 2). | 1 L | If collecting for both ICP-AES AND ICP-MS methods, a separate 1 L volume of sample must be collected for each method per sample location. | Acidify to pH <2 with $HNO_3$ and cool to 4°C (±2°C) immediately after collection.[2] DO NOT FREEZE water samples. | 6 months for all metals except Mercury (28 days) |
| | Soil/ Sediment | Use one 8 oz wide-mouth glass jar (see Table 5, Reference Number 3). | Fill to capacity | | Cool to 4°C (±2°C) immediately after collection. | 6 months |
| Metals/Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) and/or Mercury by CVAA | Water | Use one 1 L high density polyethylene glass bottle (see Table 5, Reference Number 2). | 1 L | If collecting for both ICP-AES AND ICP-MS methods, a separate 1 L volume of sample must be collected for each method per sample location. | Acidify to pH <2 with $HNO_3$ and cool to 4°C (±2°C) immediately after collection.[2] DO NOT FREEZE water samples. | 6 months for all metals except Mercury (28 days) |
| Cyanide/Spectro-photometric Determination[3] | Water | Use one 1 L high density polyethylene glass bottle (see Table 5, Reference Number 2). | 1 L | | To neutralize residual chlorine, immediately upon collection, add 0.6 g ascorbic acid for each liter of sample collected. Add NaOH until pH >12 and cool to 4°C (±2°C) immediately after collection. DO NOT FREEZE water samples. | 14 days |
| | Soil/ Sediment | Use one 8 oz wide-mouth glass jar (see Table 5, Reference Number 3). | Fill to capacity | | Cool to 4°C (±2°C) immediately after collection. | 14 days |

[1] The technical holding time is calculated from the time of sample collection. It is recommended that samplers ship samples to the laboratory the same day that they are collected, or as soon as possible thereafter.

[2] For the analysis of dissolved metals, the sampler is required to filter the sample through a membrane filter (such as a 0.45 micron pore diameter membrane filter) at the time of collection or as soon as possible thereafter. Use a portion of the sample to rinse the filter flask, discard this portion, and collect the required volume of filtrate. Then preserve as described above.

**SOURCE:** EPA Office of Superfund Remediation and Technology Innovation's Contract Laboratory Program Guidance for Field Samplers, OSWER 9240.0-35, EPA540-R-00-003, Final August 2004

**Table 5. Container Type Specifications**

| Reference Number | Container Type | Specifications | |
|---|---|---|---|
| | | Closure | Septum |
| **1** | 40 mL amber glass vial, 24 mm neck finish. | Polypropylene or phenolic, open-top screw-cap, 15 cm opening, 24-400 size. | 24 mm disc of 0.005 in Polytetrafluoroethylene (PTFE) bonded to 0.120 in silicone for total a thickness of 0.125 in. |
| **2** | 1 L high density polyethylene, cylinder-round bottle, 28 mm neck finish. | Polyethylene cap, ribbed, 28-410 size; F217 polyethylene liner. | N/A |
| **3** | 8 oz short, wide mouth, straight-sided, glass jar, 70 mm neck finish. | Polypropylene or phenolic cap, 70-400 size; 0.015 in PTFE liner. | N/A |
| **4** | 4 oz (120 mL) tall, wide mouth, straight-sided, glass jar, 48 mm neck finish. | Polypropylene or phenolic cap, 48-400 size; 0.015 in PTFE liner. | N/A |
| **5** | 1 L amber, Boston round glass bottle, 33 mm pour-out neck finish. | Polypropylene or phenolic cap, 33-430 size; 0.015 in PTFE liner. | N/A |
| **6** | 500 mL high density polyethylene, cylinder-round bottle, 28 mm neck finish. | Polypropylene cap, ribbed, 28-410 size; F217 polyethylene liner. | N/A |
| **7** | Coring tool used as a transport device (e.g., 5 g Sampler). | Has built-in closing mechanism. | N/A |
| **8** | 250 mL high density polyethylene, cylinder-round bottle, 28 mm neck finish. | | N/A |

**SOURCE:** EPA Office of Superfund Remediation and Technology Innovation's Contract Laboratory Program Guidance for Field Samplers, OSWER 9240 0-35, EPA540-R-00-003, Final August 2004

**Table 6. Quality Control (QC) Sample Types and CLP Submission Requirements**

**SOURCE:** EPA Office of Superfund Remediation and Technology Innovation's Contract Laboratory Program Guidance for Field Samplers. OSWER 9240.0-35. EPA540-R-00-003. Final August 2004

| Sample Type | Purpose | Collection[1] | CLP Sample Number |
|---|---|---|---|
| Field Duplicate | To check reproducibility of laboratory and field procedures. To indicate non-homogeneity. | Collect from areas that are known or suspected to be contaminated. Collect one sample per week or 10% (Regions may vary) of all field samples per matrix, whichever is greater. | Assign two separate (unique) CLP Sample Numbers (i.e., one number to the field sample and one to the duplicate). Submit blind to the laboratory. |
| Field Blanks | To check cross-contamination during sample collection, preservation, and shipment, as well as in the laboratory. Also to check sample containers and preservatives. | Collect for each group of samples of similar matrix per day of sampling. Organics - Use water (demonstrated to be free of the contaminants of concern). Inorganics - Use metal-free (deionized or distilled) water. | Assign separate CLP Sample Numbers to the field blanks. |
| Trip Blank (Volatile Organic Analysis Only) | To check contamination of Volatile Organic Analyte (VOA) samples during handling, storage, and shipment from field to laboratory. | Prior to going into the field, prepare and seal one sample per shipment per matrix using water demonstrated to be free of the contaminants of concern (deionized water is appropriate). Place this sample in the cooler used to ship VOA samples. | Assign separate CLP Sample Numbers to the trip blanks. |
| Equipment Blank or Rinsate Blank | To check field decontamination procedures. | Collect when sampling equipment is decontaminated and reused in the field or when a sample collection vessel (bailer or beaker) will be used. Use blank water (water decontamination to be organic-free, deionized or distilled for inorganics) to rinse water into the sample containers. | Assign separate CLP Sample Numbers to the equipment blanks. |
| Matrix Spike and Matrix Spike Duplicate (MS/MSD)[2] (Organic Analysis Only) | To check accuracy and precision of organic analyses in specific sample matrices. | Collect from areas that are known or suspected to be contaminated. For smaller sampling events (i.e., 20 samples or less), MS/MSD additional volume should be collected in the first round of sampling and included in the first shipment of samples to the laboratory. Collect double or triple volume[3] for aqueous samples and soil VOA samples designated for MS/MSD analyses. Additional sample volume is not required for soil samples requiring Semivolatile Organic Analyte (SVOA) and/or Pesticide/Polychlorinated Biphenyl (PCB) analysis. See Appendix B for VOA collection volumes. | Assign the same CLP Sample Number to the field sample and the extra volume for MS/MSD. Identify the sample designated for MS/MSD on the TR/COC Record. |
| Matrix Spike and Laboratory Duplicate (Inorganic Analysis Only) | To check accuracy and precision of inorganic analyses in specific sample matrices. | Collect from areas that are known or suspected to be contaminated. For smaller sampling events (i.e., 20 samples or less), Matrix Spike and laboratory duplicates should be collected in the first round of sampling and included in the first shipment of samples to the laboratory. Additional sample volume may be required for inorganic analysis.[4] | Assign the same CLP Sample Number to the field sample and extra volume (if collected). Identify the sample(s) designated for Matrix Spike and laboratory duplicates on the TR/COC Record. |
| Performance Evaluation (PE) Samples | Specially-prepared QC samples used to evaluate a laboratory's analytical proficiency. | The PE samples contain analytes with concentrations unknown to the laboratory. Designated Regional or authorized personnel (depending on Regional policy) arrange for Case-specific CLP PE samples to be prepared and shipped by the Quality Assurance Technical Support (QATS) contractor. The PE samples can be shipped to the site, or shipped per Regional direction. QATS provides the appropriate preparation instructions and chain-of-custody materials. | Samplers have no direct interaction with the PE sampling process, but should be aware that such samples do exist within the CLP sampling process. **Samplers must, however, order PE samples and ship them to the laboratory if required by the Region.** |

[1] Consult Regional or Project Manager guidance for field QC sample frequencies: laboratory QC sample frequencies are generally fixed in the laboratory subcontracts or specified in analytical methods. Current frequency for MS/MSD (organic) and MS/duplicate (inorganic) for the CLP is one sample per twenty field samples of similar matrix.

[2] Samples sent under the Low Concentration Organic SOW (OLC03.2) do not require an MS or MSD, but the Region may opt to send them at their discretion.

[3] Example of double volume: An aqueous sample for SVOA analysis would require the field sampler to collect at least 2 L of field sample and at least 1 L each for the MS and MSD samples for a total volume of 4 L. If Pesticide/PCB MS/MSD analyses are required for the same sample, an additional 4 L must be collected. Double volume is the MINIMUM allowable volume for samples designated for MS/MSD analysis. Triple volume may be sent for MS/MSD samples to allow for sufficient volume for these analyses in the event sample volume is lost as a result of samples breaking, leaking, or laboratory accidents.

[4] Double volume may be sent for inorganic aqueous MS and laboratory duplicate samples to allow for sufficient volume for these analyses in the event sample volume is lost as a result of samples leaking or laboratory accidents.

# APPENDIX

[illegible]
[illegible]

FINAL AUGUST 2004

Office of Superfund Remediation and Technology Innovation

# Contract Laboratory Program Guidance for Field Samplers

Disclaimer: This final version of the document replaces any prior versions of the document in their entirety.

| Table 1-2. Container Type Specifications | | | |
|---|---|---|---|
| Reference Number | Container Type | Specifications | |
| | | Closure | Septum |
| 1 | 40 mL amber glass vial, 24 mm neck finish. | Polypropylene or phenolic, open-top screw-cap, 15 mm opening, 24-400 size. | 24 mm disc of 0.005 in Polytetrafluoroethylene (PTFE) bonded to 0.120 in silicone for total a thickness of 0.125 in. |
| 2 | 1 L high density polyethylene, cylinder-round bottle, 28 mm neck finish | Polyethylene cap, ribbed, 28-410 size, F217 polyethylene liner. | N/A |
| 3 | 8 oz short, wide mouth, straight-sided, glass jar, 70 mm neck finish | Polypropylene or phenolic cap, 70-400 size; 0.015 in PTFE liner. | N/A |
| 4 | 4 oz (120 mL) tall, wide mouth, straight-sided, glass jar, 48 mm neck finish. | Polypropylene or phenolic cap, 48-400 size, 0.015 in PTFE liner. | N/A |
| 5 | 1 L amber, Boston round glass bottle, 33 mm pour-out neck finish. | Polypropylene or phenolic cap, 33-430 size; 0.015 in PTFE liner. | N/A |
| 6 | 500 mL high density polyethylene, cylinder-round bottle, 28 mm neck finish. | Polypropylene cap, ribbed, 28-410 size; F217 polyethylene liner. | N/A |
| 7 | Coring tool used as a transport device (e.g., 5 g Sampler). | Has built-in closing mechanism. | N/A |
| 8 | 250 mL high density polyethylene, cylinder-round bottle, 28 mm neck finish | | N/A |

Table 3-1. Quality Control (QC) Sample Types and CLP Submission Requirements

| Sample Type | Purpose | Collection [1] | CLP Sample Number |
|---|---|---|---|
| Field Duplicate | To check reproducibility of laboratory and field procedures. To indicate non-homogeneity. | Collect from areas that are known or suspected to be contaminated. Collect one sample per week or 10% [illegible] of all field samples per matrix, whichever is greater. | Assign two separate (unique) CLP Sample Numbers (i.e., one number to the field sample and one to the duplicate). Submit blind to the laboratory. |
| Field Blanks | To check cross-contamination during sample collection, preservation, and shipment, as well as in the laboratory. Also to check sample containers and preservatives. | Collect for each group of samples of similar matrix per day of sampling. [illegible] water blank [illegible] free of the contaminants of concern. [illegible] | Assign separate CLP Sample Numbers to the field blanks. |
| Trip Blank (Volatile Organic Analysis Only) | To check contamination of Volatile Organic Analysis (VOA) samples during handling, storage, and shipment from field to laboratory. | [illegible] one sample per shipment per matrix [illegible] water [illegible] to be free of the contaminants of concern [illegible] appropriate. Use this sample to [illegible] VOA samples. | Assign separate CLP Sample Numbers to the trip blanks. |
| Equipment Blank or Rinsate Blank | To check field decontamination procedures. | Collect when sampling equipment is decontaminated and reused in the field or when a sample collection vessel [illegible] will be used. Use blank water [illegible] decontamination to be [illegible]-free, [illegible] rinse water into the sample containers. | Assign separate CLP Sample Numbers to the equipment blanks. |
| Matrix Spike and Matrix Spike Duplicate (MS/MSD) (Organic Analyses Only) | To check accuracy and precision of organic analyses in specific sample matrices. | Collect from areas that are known or suspected to be contaminated. For smaller sampling events (i.e., 20 samples or less), MS/MSD [illegible] should be collected in the first round of sampling and included in the first shipment of samples to the laboratory. Collect double or triple volume for aqueous samples and [illegible] VOA samples designated for MS/MSD analyses. Additional sample volume is not required for soil samples [illegible] Organic Analysis [illegible] analyses. See Appendix [illegible] for VOA collection volumes. | Assign the same CLP Sample Number to the field sample and the extra volume for MS/MSD. Identify the sample designated for MS/MSD on the TR/COC Record. |
| Matrix Spike and Laboratory Duplicate (Inorganic Analyses Only) | To check accuracy and precision of inorganic analyses in specific sample matrices. | Collect from areas that are known or suspected to be contaminated. For smaller sampling events (i.e., 20 samples or less), Matrix Spike and laboratory duplicates should be collected in the first round of sampling and included in the first shipment of samples to the laboratory. Additional sample volume may be required for [illegible] analyses. [illegible] | Assign the same CLP Sample Number to the field sample and extra volume (if collected). Identify the sample(s) designated for Matrix Spike and laboratory duplicates on the TR/COC Record. |
| Performance Evaluation (PE) Samples | Specially prepared QC samples used to evaluate a laboratory's analytical proficiency. | The PE samples contain analytes with concentrations unknown to the laboratory. [illegible] Regional or authorized personnel [illegible] Regional policy [illegible] PE samples to be prepared and shipped by the Quality Assurance Technical Support (QATS) contractor. The PE samples can be shipped to the site or shipped per Regional direction. QATS provides the appropriate preparation instructions and [illegible] | Samplers have no direct interaction with the PE sampling process, but should be aware that such samples [illegible] within the CLP sampling process. Samplers must, however, order PE samples and ship them to the laboratory if required by the Region. |

**Table 3-2. Low Medium and Low Concentration Organic Collection Parameters (SOW OLM04.3 and OLC03.2)**

| Analysis | Matrix | Containers | Volume/ Mass | Important Notes | Preservative | Technical Holding Time[1] |
|---|---|---|---|---|---|---|
| Volatile Organic Analyses (VOAs) | Water | At least two 40 mL glass containers with Polytetrafluoroethylene (PTFE)-lined septa and open top screw-caps (see Table 2-2, Reference Number 1).<br><br>If Selected Ion Monitoring (SIM) analysis is requested, at least two additional 40 mL glass containers with PTFE-lined septa and open top screw-caps that are filled to capacity with no air bubbles, preserved to a pH of 2 with HCL and cooled to 4°C (±2°C) immediately after collection (see Table 2-2, Reference Number 1). | Fill to capacity | Vials must be filled to capacity with no headspace or air bubbles.<br><br>Refer to Appendix C for samples requiring QC analyses. | Preserve to a pH of 2 with HCl and cool to 4°C (±2°C) immediately after collection.[2] DO NOT FREEZE water samples. | 14 days |
| | Soil/Sediment | Option 1<br>At least three 40 mL glass containers with PTFE-lined septa and open top screw-caps, pre-weighed and containing magnetic stir bars (see Table 2-2, Reference Number 1). | 5 g | Place samples on side prior to being frozen.<br><br>Refer to Appendix B for samples requiring QC analyses. | Frozen (-7°C and -15°C) | 14 days |
| | | AND<br><br>One container of sample filled with no headspace for determination of moisture content. | 5 g | Refer to Appendix B for samples requiring QC analyses. | Iced to 4° (±2°C) | 48 hours |
| | | Option 2<br>At least three 40 mL glass containers with PTFE-lined septa and open top screw-caps, pre-weighed and containing magnetic stir bars (see Table 2-2, Reference Number 1). Two of the containers will also contain 5 mL of water. | 5 g | Place samples on side prior to being frozen.<br><br>Refer to Appendix B for samples requiring QC analyses. | Frozen (-7°C and -15°C) | 14 days |
| | | AND<br><br>One container of sample filled with no headspace for determination of moisture content. | 5 g | Refer to Appendix B for samples requiring QC analyses. | Iced to 4° (±2°C) | 48 hours |

**Table 3-2. Low Medium and Low Concentration Organic Collection Parameters (SOW OLM04.3 and OLC03.2) (Con't)**

| Analysis | Matrix | Containers | Volume/ Mass | Important Notes | Preservative | Technical Holding Time[1] |
|---|---|---|---|---|---|---|
| Volatile Organic Analyses (VOAs) (Con't) | Soil/Sediment | Option 3:<br>At least three coring tools used as transport devices (e.g., 5 g Samplers) (see Table 2-2, Reference Number 7).<br><br>AND<br><br>One container of sample filled with no headspace for determination of moisture content. | 5 g | Refer to Appendix B for samples requiring QC analysis. | Frozen (-7°C and -15°C) or iced to 4° (±2°C). | 48 hours |
| Semivolatile Analysis | Water | At least two 1 L amber glass bottles, fitted with screw-caps lined with PTFE (see Table 2-2, Reference Number 5). | 2 L | If amber containers are not available, the samples should be protected from light. | Cool all samples to 4°C (±2°C) immediately after collection. DO NOT FREEZE water samples. | 7 days |
| | Soil/Sediment | Use one 8 oz wide-mouth glass jar or two 4 oz wide-mouth glass jars (see Table 2-2, Reference Numbers 3 and 4). | Fill to capacity | | Cool all samples to 4°C (±2°C) immediately after collection. | 14 days |
| Pesticides/ Aroclors | Water | At least two 1 L amber glass bottles, fitted with screw-caps lined with PTFE (see Table 2-2, Reference Number 5). | 2 L | If amber containers are not available, the samples should be protected from the light. | Cool all samples to 4°C (±2°C) immediately after collection. DO NOT FREEZE water samples. | 7 days |
| | Soil/Sediment | Use one 8 oz wide-mouth glass jar or two 4 oz wide-mouth glass jars (see Table 2-2, Reference Numbers 3 and 4). | Fill to capacity | | Cool all samples to 4°C (±2°C) immediately after collection. | 14 days |

[1]This technical holding time is calculated from the time of sample collection to sample extraction. Sample extracts are to be analyzed within 40 days of extraction. It is recommended that samplers ship samples to the laboratory on the same day that they are collected, or as soon as possible thereafter.

[2]Check Regional guidance regarding use of acid preservatives when testing for carbonates, residual chlorine, and other oxidants.

[3]When sampling for VOAs in soil using the CLP options of SW-846 Method 5035A, samplers should use the requirements that are provided in Appendix B.

| Table 3-3. Inorganic Sample Collection Parameters (SOW ILM05.3) | | | | | | |
|---|---|---|---|---|---|---|
| **Target Analyte/Method** | **Matrix** | **Containers** | **Volume/ Mass** | **Important Notes** | **Preservative** | **Technical Holding Time**[1] |
| Metals Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) and/or Mercury by Cold Vapor Atomic Absorption (CVAA) | Water | Use one 1 L high density polyethylene plastic bottle (see Table 2-2, Reference Number 2). | 1 L | If collecting for both ICP-AES AND ICP-MS methods, a separate 1 L volume of sample must be collected for each method per sample location | Acidify to pH <2 with $HNO_3$ and cool to 4°C (±2°C) immediately after collection.[2] DO NOT FREEZE water samples. | 6 months for all metals except Mercury (28 days) |
| | Soil/ Sediment | Use one 8 oz wide-mouth glass jar (see Table 2-2, Reference Number 3). | Fill to capacity | | Cool to 4°C (±2°C) immediately after collection. | 6 months |
| Metals Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) and/or Mercury by CVAA | Water | Use one 1 L high density polyethylene plastic bottle (see Table 2-2, Reference Number 2). | 1 L | If collecting for both ICP-AES AND ICP-MS methods, a separate 1 L volume of sample must be collected for each method per sample location. | Acidify to pH <2 with $HNO_3$ and cool to 4°C (±2°C) immediately after collection.[2] DO NOT FREEZE water samples. | 6 months for all metals except Mercury (28 days) |
| Cyanide Spectro-photometric Determination[3] | Water | Use one 1 L high density polyethylene plastic bottle (see Table 2-2, Reference Number 2). | 1 L | | To neutralize residual chlorine, immediately upon collection, add 0.6 g ascorbic acid for each liter of sample collected.<br><br>Add NaOH until pH >12 and cool to 4°C (±2°C) immediately after collection. DO NOT FREEZE water samples. | 14 days |
| | Soil/ Sediment | Use one 8 oz wide-mouth glass jar (see Table 2-2, Reference Number 3). | Fill to capacity | | Cool to 4°C (±2°C) immediately after collection. | 14 days |

[1] The technical holding time is calculated from the time of sample collection. It is recommended that samplers ship samples to the laboratory the same day that they are collected, or as soon as possible thereafter.

[2] For the analysis of dissolved metals, the sampler is required to filter the sample through a membrane filter (such as a 0.45 micron pore diameter membrane filter) at the time of collection or as soon as possible thereafter. Use a portion of the sample to rinse the filter flask, discard this portion, and collect the required volume of filtrate. Then preserve as described above.

[3] Samplers must test for sulfide and oxidizing agents (e.g., chlorine) in aqueous samples in the field upon collection. Please refer to the SAP and Appendix C for guidance. Sulfides adversely affect the analytical procedure. The following can be done to test for and neutralize sulfides. Place a drop of the sample on lead acetate test paper to detect the presence of sulfides. If sulfides are present, treat 25 mL more of the sample than that required for the cyanide determination with powdered cadmium carbonate or lead carbonate. Yellow cadmium sulfide or black lead sulfide precipitates if the sample contains sulfide. Repeat this operation until a drop of the treated sample solution does not darken the lead acetate test paper. Filter the solution through a dry filter paper into a dry beaker, and from the filtrate measure the sample to be used for analysis. Avoid a large excess of cadmium carbonate and a long contact time in order to minimize a loss by complexation or occlusion of cyanide on the precipitated material. Sulfide removal should be performed in the field, if practical, prior to pH adjustment with NaOH.

# REFERENCES

**Carborundum. 1981.**

Carborundum. 1981. "Summary of Environmental Testing Program at Jacksboro, Tennessee Electro Minerals Plant Site", March 13.

SUMMARY OF ENVIRONMENTAL TESTING PROGRAM AT

JACKSBORO, TENNESSEE ELECTRO MINERALS PLANT SITE

OCTOBER 22, 1980 AND JANUARY 27, 1981


PREPARED BY: Ronald J. Reid, III

APPROVED BY: Robert L. Wilcox


MARCH 13, 1981

SUMMARY OF ENVIRONMENTAL TESTING PROGRAM AT
JACKSBORO, TENNESSEE ELECTRO MINERALS PLANT SITE
OCTOBER 22, 1980 AND JANUARY 27, 1981

Two sampling and analysis programs were undertaken by Carborundum's Environmental Services Department to determine the environmental status of materials and wastes located at the Jacksboro, Tennessee Electro Minerals Division former plant site.

The materials in question were storage piles of raw materials (coke, sand), silicon carbide, and "old mix". The wastes consisted of a covered dump (dust collector fines), and two ponds which had been constructed to prevent runoff from the property.

The initial program was designed to determine whether or not these materials and wastes were regulated by the Environmental Protection Agency's Hazardous Waste Management System (RCRA), as promulgated February 26, 1980 (Federal Register, Volume 45, Number 39) and May 19, 1980 (Federal Register, Volume 45, Number 98). A total of thirty-eight (38) samples were collected on October 22, 1980, and analyzed in accordance with the requirements of these regulations. None of the samples tested were "hazardous" by the E.P.A. definition. As a result of this program, some of the materials stored at the site have been removed, and negotiations are currently underway to remove the remaining materials.

The second sampling and analysis program commenced on January 27, 1981, and was designed to determine which, if any, toxic or hazardous substances are present in the dump, pond water or pond. Additionally, tests were performed to determine the potential for these substances to leach from the materials and subsequently contaminate groundwater.

A total of five (5) composited samples were collected; four (4) from areas suspected to contain pollutants and one (1) to serve as a background sample. These samples were analyzed for 127 of the 129 E.P.A. Priority Pollutants.* This list of substances was developed by court order as the result of a suit brought against the E.P.A. by the Natural Resources Defense Council (NRDC) et. al. The priority pollutants represent those substances thought to be most worthy of immediate attention with respect to their potential to cause environmental damage.

The initial analyses showed that samples from two (2) areas (dump, "dry pond") contained priority pollutants. All organics in these two samples were at levels below 100 parts

*No analyses were performed for asbestos or TCDD (dioxin). Neither is pertinent to wastes disposed at the site and both require very special analysis.

per million (ppm). With the exception of zinc and copper (which did not exceed 200 ppm), all metals were also under 100 ppm.*

The two samples in which priority pollutants were detected were then subjected to the E.P.A. Leachate test procedure, designed to simulate the effect of natural leaching on the waste. The resulting leachate samples were then re-analyzed for the presence of priority pollutants. With the exception of methylene chloride and phenol, no contamination of the leachate was detected. Both of these were noted in trace amounts below the limits to accurately quantitate using accepted analytical methodology. In the case of methylene chloride, it is suspected that this was inadvertently and unavoidably introduced into the sample in the laboratory since it is a widely used volatile organic solvent. In the case of phenol, the trace amount noted (25 ppb) is more than two orders of magnitude below the presently published level to protect human health (3,500 ppb - Federal Register, Volume 45, Number 231/November 28, 1980).

The analytical results of this project show that the waste material does contain some pollutants of concern. Leachate testing demonstrates, however, that these substances are unlikely to contaminate area groundwater.

*NOTE: Due to the nature of the materials in the dump and dry pond, it would be expected that priority pollutants would be detected. The sampling and/or tests would have been subject to suspicion if they had not been detected.

**MCI. 1981.**

MCI. 1981. "Close-out Procedures, The Carborundum Company". August 24.

**MCI/CONSULTING ENGINEERS, INC.**
P. O. Box 23154
McBride Lane
Knoxville, Tennessee 37922
Telephone (615) 966-9788

August 24, 1981

Division of Solid Waste Management
Department of Public Health
East Tennessee Regional Office
1522 Cherokee Trail
Knoxville, TN 37920

Attention: Mr. Mark Burris

RE: Close-out Procedures
The Carborundum Company
Jacksboro, Tennessee
MCI-81-455

Dear Mr. Burris:

Enclosed are two copies of the plans necessary for close-out of the subject facility. The subject plans and monitoring wells have been completed in accordance with specific guidelines recommended by the Tennessee Division of Solid Waste Management. Construction activities for close-out should commence by August 31, 1981. Upon review of the enclosed material, the Carborundum Company requests documented approval before major construction for close-out begins.

The Carborundum Company also requests that you or another DSWM representative observe at least a portion of the close-out construction activities. In addition, the company requests that you examine the site after completion of the construction activities to document implementation of your recommendations as referenced in your letter of June 24, 1981.

Division of Solid Waste Management
August 24, 1981
Page 2

If you have any questions regarding the subject project, please feel free to call me.

Sincerely,

MCI/Consulting Engineers, Inc.

R. Randolph Ferguson

R. Randolph Ferguson
Environmental Engineer

RRF/aab

Enclosures

TABLE OF CONTENTS

APPENDICES

**Noll. 1981.**

Noll. 1981. Letter from J. McDowell, Noll Associates to J. Leonard, DSWM. June 10.

JUN 12 1981

**NOLL ASSOCIATES TENNESSEE INCORPORATED**
ENVIRONMENTAL ENGINEERS

June 10, 1981

Mr. John Leonard
Tennessee Department of Public Health
Division of Solid Waste Management
1522 Cherokee Trail
Knoxville, Tennessee 37920

Dear Mr. Leonard:

Pursuant to agreements reached at the June 9, 1981 meeting at your office with Kennecott Company representatives, we are enclosing a four-page general description of the silicon carbide manufacturing process formerly used at the Carborundum Company plant near Jacksboro, Tennessee,

Also enclosed are three copies of a plant site plan which identifies the old mix stockpile location, the refuse pile location and the "natural pond" location.

If you need additional information, please contact me or Mr. Wilcox.

Sincerely yours,

NOLL ASSOCIATES TENNESSEE, INC.

John R. McDowell
John R. McDowell
Vice President

jj

cc: Mr. Bob Wilcox

Enclosures

1423 COKER AVENUE KNOXVILLE, TENNESSEE 37917 (615)523-7900

## INTRODUCTION

The manufacturing facility which is the subject of this report is an electric furnace facility of The Carborundum Company located at Jacksboro, Tennessee. The plant was constructed by The Carborundum Company and began operation in 1971. It currently produces about 25,000 tons per year of "Ferro-Carbo," a granular material high in silicon carbide content, which is ultimately used as a metallurgical additive in the cast iron and steel industries.

Raw materials produced in the manufacture of Ferro-Carbo include petroleum coke and sand. These materials are batched in proper proportions and heated to reaction temperature in an open car furnace. Upon completion of the reaction, the batch is cooled and unloaded, with the reacted product then being separated from unreacted raw material ("old mix"). The reacted material is then crushed and blended to form the final end product. A simplified schematic diagram of the process is shown in Figure 1.

Figure 2 is a schematic diagram identifying the main buildings at the plant site. Raw materials generally arrive by rail and are normally bottom dumped into a track hopper in building 22 and conveyed directly to storage silos in building 21. Rail shipment schedules cannot be expected to match production schedules; consequently raw materials are also stockpiled in the open, principally in the north and northeast portions of Figure 2. Stockpiles of old mix and wet sawdust are also stockpiled in this general area. The sawdust is blended with the raw materials to help maintain porosity during subsequent processing.

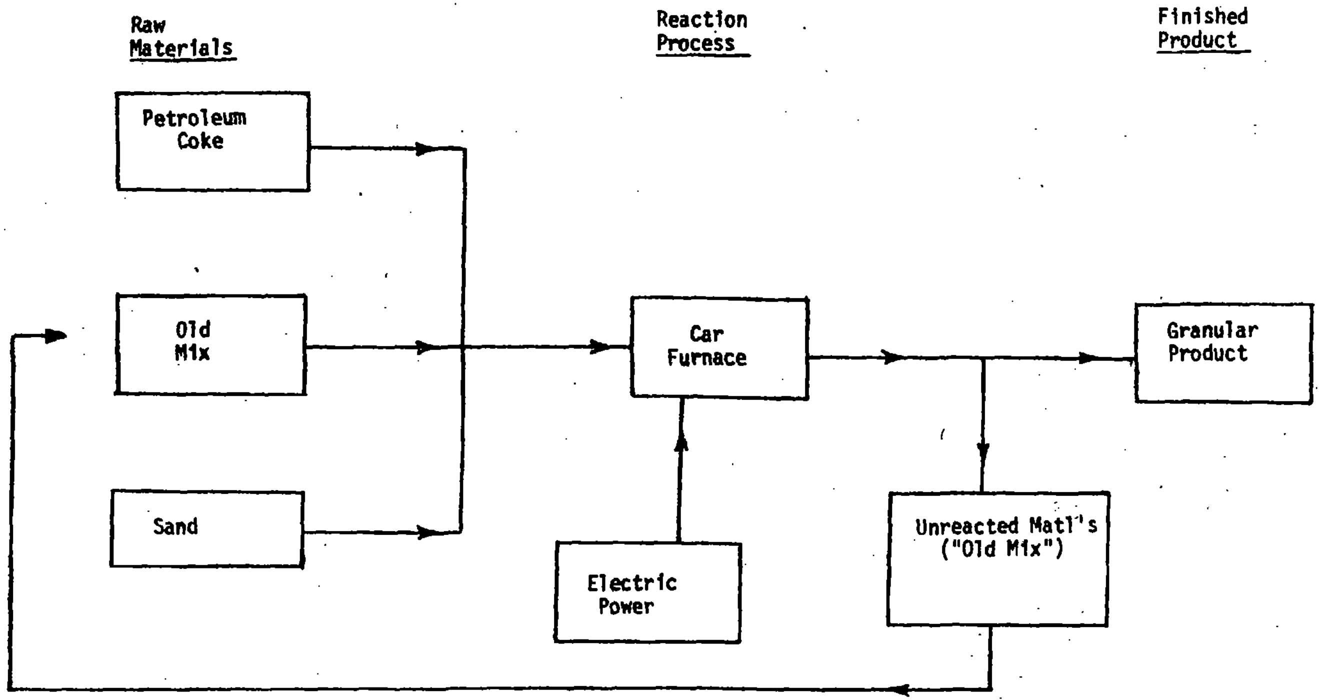


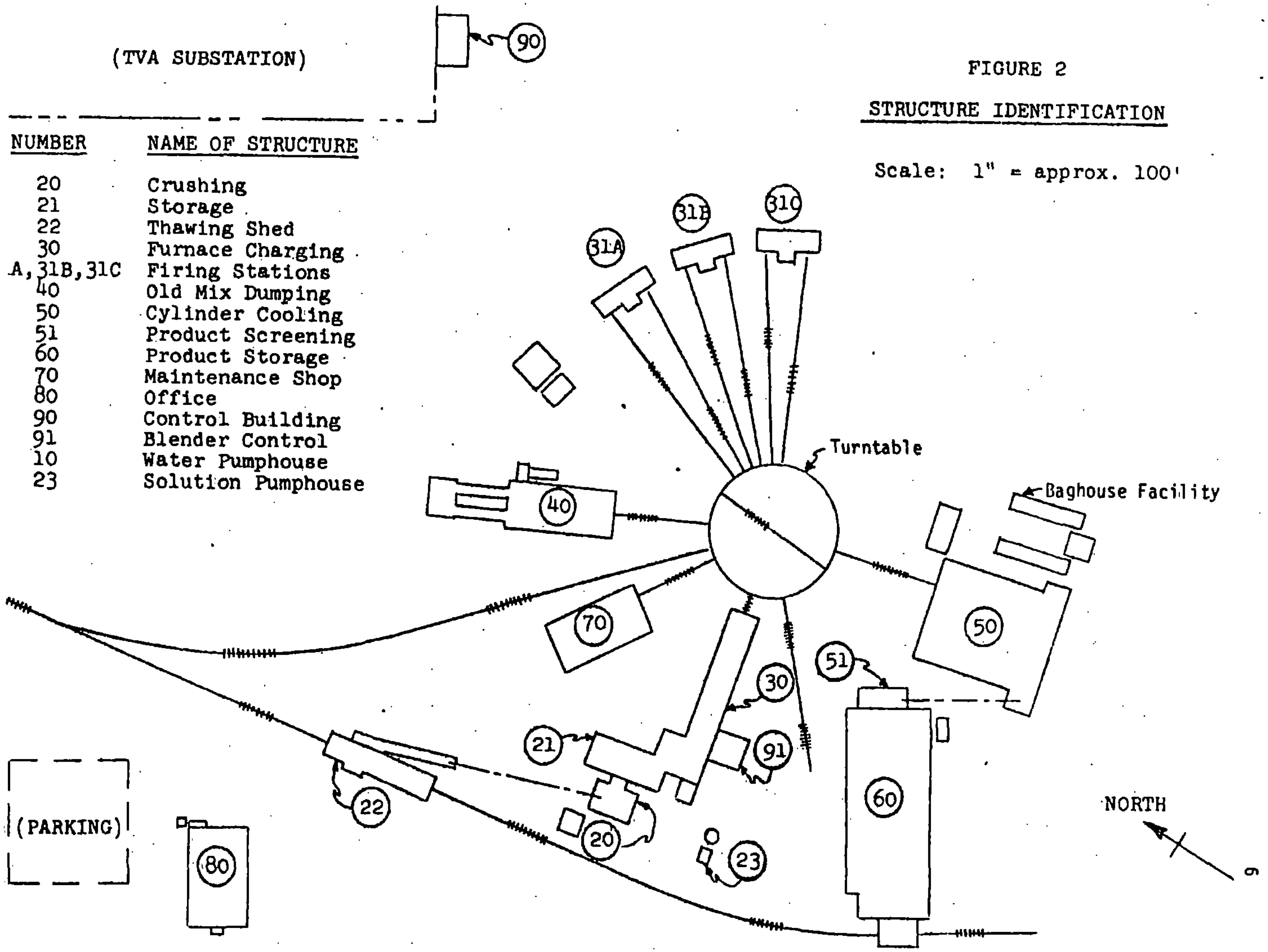

Figure 1

Process Flow Diagram

FIGURE 2

STRUCTURE IDENTIFICATION

Scale: 1" = approx. 100'




| NUMBER | NAME OF STRUCTURE |
|---|---|
| 20 | Crushing |
| 21 | Storage |
| 22 | Thawing Shed |
| 30 | Furnace Charging |
| A,31B,31C | Firing Stations |
| 40 | Old Mix Dumping |
| 50 | Cylinder Cooling |
| 51 | Product Screening |
| 60 | Product Storage |
| 70 | Maintenance Shop |
| 80 | Office |
| 90 | Control Building |
| 91 | Blender Control |
| 10 | Water Pumphouse |
| 23 | Solution Pumphouse |

Raw material proportioning and loading into the car furnaces occurs in buildings 21 and 30. During the loading process, a core of graphite is placed lengthwise within the charge to provide electrical conductivity and to establish a suitable resistance between terminals situated at either end of the furnace. The loaded car furnace is then transferred through a railway turntable to one of six firing stations, buildings 31A, 31B or 31C, were the electrical hookup is accomplished. A suitable reaction temperature is then established and maintained until the reaction is complete.

After a suitable cooling period, the car furnace is moved to building 40 where the unreacted material is removed. During the reaction process, this material serves to insulate sides of the car furnace from intense heat developed at the core. This unreacted material, now known as "old mix," is transferred to the old mix storage pile for subsequent re-use.

The car furnace with the reacted material is then allowed to cool further, afterwhich it is routed to building 50 for final unloading. At this point, the reacted material is in the form of a large hollow cylinder. Chunks of the cylinder are dislodged by a clamshell crane and removed to the floor of the building. This material is subsequently fed to a crusher, located in building 50, and then transferred by conveyor to buildings 51 and 60 for final processing. The finished product is shipped from the plant by truck and rail.